

Allis-Chalmers Gets AAP Fuel Cell Work

NASA has awarded a \$3,500,000 contract to Allis-Chalmers, Milwaukee, Wisconsin, to flight qualify an improved fuel cell electrical power system for the Apollo Applications Program.

The power system, called a Multi-mission Fuel Cell Assembly, has been developed by Allis-Chalmers under three previous NASA contracts since 1962.

Under terms of this contract, Allis-Chalmers will produce four fuel cell assemblies, two for use in the qualification program and two to be delivered to MSC.

The qualification program will, in part, attempt to verify a fuel cell lifetime of 2,500 hours to insure adequate margins for 1,500 hour missions.

The Allis-Chalmers fuel cell assembly is similar in size and operation to the present Apollo fuel cell. Three of the advanced fuel cells can be installed in the same location in the Apollo Service Module as the three fuel cells currently used in the Apollo program.

The Multi-mission Fuel Cell Assembly offers significant improvements in performance over the Apollo fuel cell. Tests have shown the unit to produce about 2,800 watts of electrical power at 27 volts DC—about twice the power output of the present fuel cell. It operates at a lower temperature, about 190 degrees Fahrenheit compared with about 400 degrees for current models, and it weighs about 185 pounds compared with about 240 pounds for the Apollo fuel cell.

The Multi-mission Fuel Cell Assembly uses cryogenically

Deadline Set For Scholarship Applications

College-age children of MSC employees may be eligible for financial assistance under a college scholarship program established by the NASA Exchange Council—MSC. Paying up to \$600 per academic year, or \$150 per academic quarter, not to exceed a maximum of \$2400, the fund awards will be made on the basis of financial need and high school scholastic standing.

Scholarship winners may pursue any course of study leading to a recognized bachelor's degree at any accredited college in the country. Applicants must be unmarried dependents of NASA employees who have been at MSC for at least two years as of January 1 and whose base income does not exceed \$12,000 per year.

Students who will be graduated from public, private, or parochial high schools in January or June are eligible to apply provided they have a high school grade average of 3.5 on the 5.0 scale or 2.5 on the 4.0 scale, and a Scholastic Aptitude Test score of 1000. Students who have taken the American College Test must have scored 22 or higher.

Where base family income exceeds \$12,000 per year and it is felt there are extenuating circumstances, scholarships may also be applied for.

(Continued on Page 4)

stored hydrogen and oxygen which react electro-chemically to produce electricity and water. Like the Apollo fuel cell, it uses potassium hydroxide as the electrolyte; however, the electrolyte is contained in an asbestos matrix at reduced concentrations rather than in a free molten state, permitting lower temperature operation.

Spring Semester UofH Course Lists Mailed

A list of proposed courses to be offered by the University of Houston Clear Lake Graduate Center during the 1969 spring semester, has been mailed to approximately 1,000 MSC employees who are on the permanent mailing list to receive information concerning this program. These employees have been asked to indicate which courses they would be interested in taking, and to return the lists to the Employee Development Branch, BP3, by December 9. Information from these lists will be used by the University of Houston and the Employee Development Branch in determining which courses will actually be offered during the 1969 spring semester.

Any employee who desires a list of the proposed courses, and who is not on the permanent mailing list, should contact the Employee Development Branch at Extension 7311. Anyone who wishes to participate in this program who has not previously applied for admission to the University of Houston Graduate School is reminded that the deadline for application for the spring semester is December 15.

Link With Earth



EARS OF APOLLO VIII—The high-gain unified S-Band antenna juts out from the Apollo VIII service module aft bulkhead during mating operations at Kennedy Space Center Manned Spacecraft Operations Building. The antenna, flown for the first time on this mission, will transmit television, voice and high-bit rate telemetry from the spacecraft and receive ground communications. Deployed after the translunar injection burn and separation from the S-IVB stage, the high-gain antenna will be the primary link with deep-space tracking gear in the Manned Space Flight Network. Should the antenna malfunction, voice communications, spacecraft command and low-bit rate telemetry can be handled by the spacecraft's omni antennas.

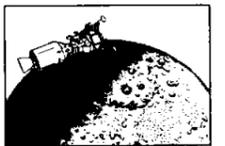
ROUNDUP

NASA MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

VOL. 8, NO. 4

DECEMBER 6, 1968



Apollo VIII Countdown Tests Scheduled Early Next Week

Apollo VIII space vehicle preflight testing at NASA Ken-

nedy Space Center continued today to progress satisfactorily toward the planned December 21 launch date.

Hypergolic fuel loading of the spacecraft and RP-1 fueling of the Saturn V first stage and first stage engine leak checks were run prior to the "wet" phase of the countdown demonstration test which was scheduled to begin yesterday. Wet-phase liftoff is set for Monday at 6:51 am CST. A manned dry countdown demonstration test with prime crewmen Frank Borman, James Lovell and Bill Anders is scheduled with liftoff at the same time on Tuesday.

The Apollo IX command and service modules November 30 were mated with LM 3 in the Manned Spacecraft Operations Building prior to being moved to the Vehicle Assembly Building for mating last Tuesday with the mission's Saturn V launch vehicle. The Lunar module earlier had been mated to the spacecraft/LM adapter and installation of adapter panel separation pyrotechnics was completed.

Command and service modules for the Apollo X mission early this week were moved into the KSC altitude chamber and mated. Three manned simulated flights of the Apollo X lunar module were scheduled this week in the altitude chamber with prime crewmen Thomas

Stafford and Eugene Cernan and backups Gordon Cooper and Edgar Mitchell taking part.

In support testing at MSC, an Apollo command module November 26 was dropped at the full-scale Land and Water Impact Test Facility in a simulation of an out-of-limits pad abort under launch wind conditions greater than expected. Command module airframe 002 was dropped at a vertical velocity of 32 feet per second and at a horizontal velocity of 54 feet per second. The spacecraft was fitted with impact attenuation couch struts of the type that are in the Apollo VIII command module and carried three anthropomorphic dummies. Test data first-look shows that the test was successful, but detailed evaluation is under way.

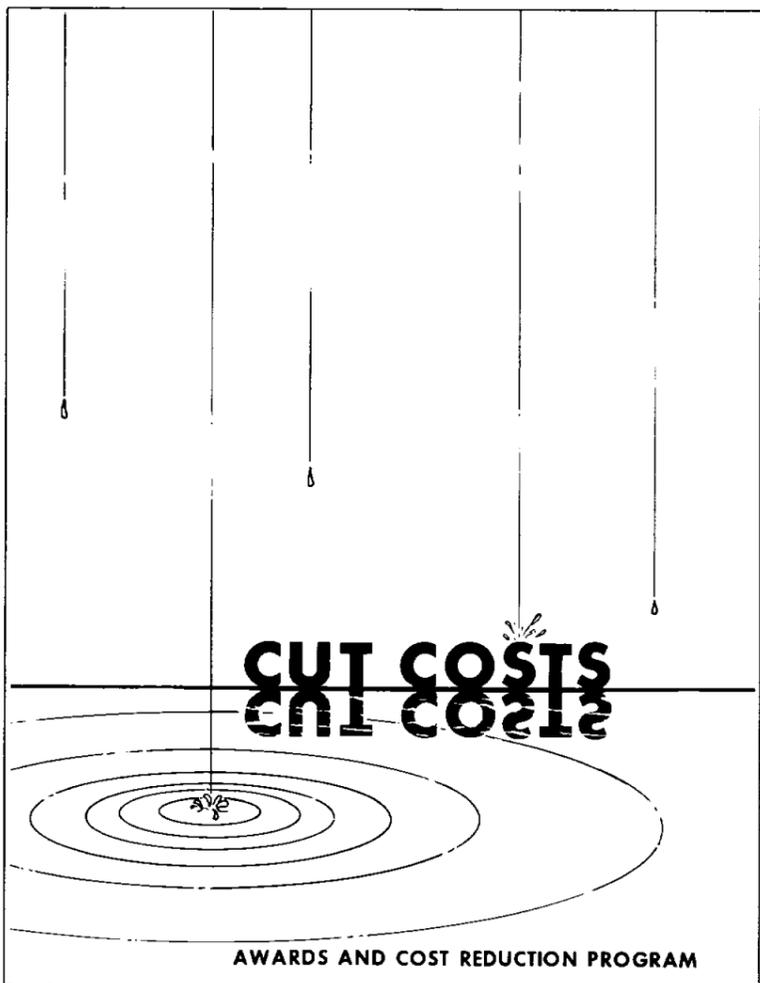
A news conference with the Apollo VIII prime crew, last to be held prior to the mission, will be held at 10 am tomorrow in the MSC Auditorium. In other press activities at MSC, a briefing and tour of the Lunar Receiving Laboratory for newsmen was scheduled at 9 this morning—their last chance to go into the lab before the Crew Reception Area and Sample Operations Area are closed later this month in preparation for LRL simulations early next year.

En Route to Rendezvous with the Moon



NOT-SO SHELTERING PALMS—The Apollo VIII spacecraft and launch vehicle stack inches its way along the crawlerway between the Kennedy Space Center Vehicle Assembly Building and Launch Complex 39A. The mobile launch tower and the space vehicle were moved the 3.5 miles by the crawler-transporter which literally picks up the load and places it on support columns at LC-39A. The trek was made October 9.

Use Christmas Seals.



Exchange Store Offers Gift Ideas

Christmas shoppers may find something at the MSC Exchange Store in the Bldg 3 Cafeteria that the person "who has everything" does not have. Most of the items stocked by the store have a space theme—Mercury, Gemini and Apollo tie bars and tacks, key chains, cufflinks, charms, bracelets, pins and earrings.

The store also stocks space history and technical books, some of which were written by MSC people. Store hours are 9 am to 4 pm Monday through Friday and noon to 5 pm Sundays.

Mueller Outlines Space Future

The next major thrust in space may be the development of an economical launch vehicle for shuttling between earth and installations such as space stations in orbit.

Dr. George E. Mueller, NASA associate administrator for manned space flight, said such a program would reduce the cost of putting payloads in space and permit access to these payloads after they have been orbited.

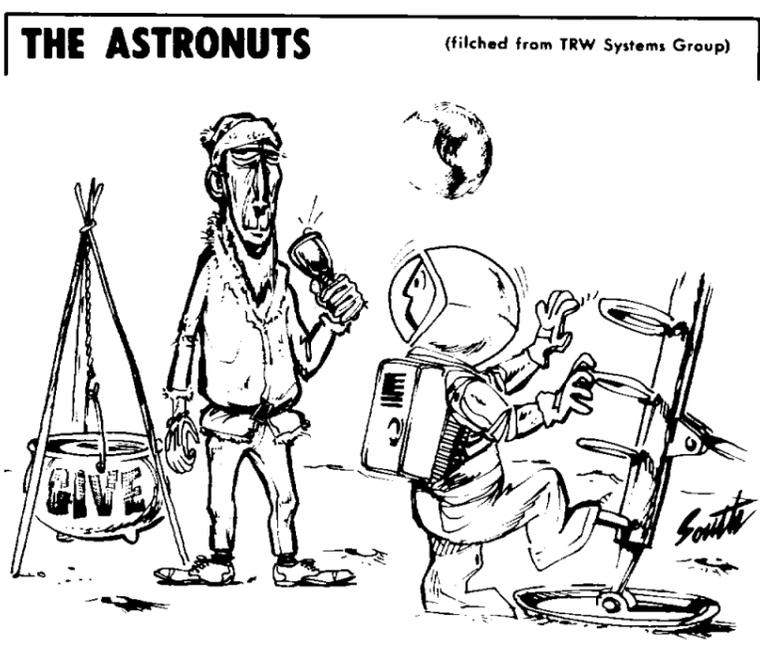
Development of an economical space shuttle has been under study for over a decade. The shuttle would operate in a manner similar to large commercial air transports and would be compatible with the environment of major airports.

Mueller says the shuttle should be able to take off vertically from a small pad at an airbase or major airport or floating launch pads in ports or other water areas. Crews comparable to aircraft ground crews would service the craft for launch.

Upon return from orbit, the shuttle would reenter the atmosphere and coast almost like a glider to a runway landing.

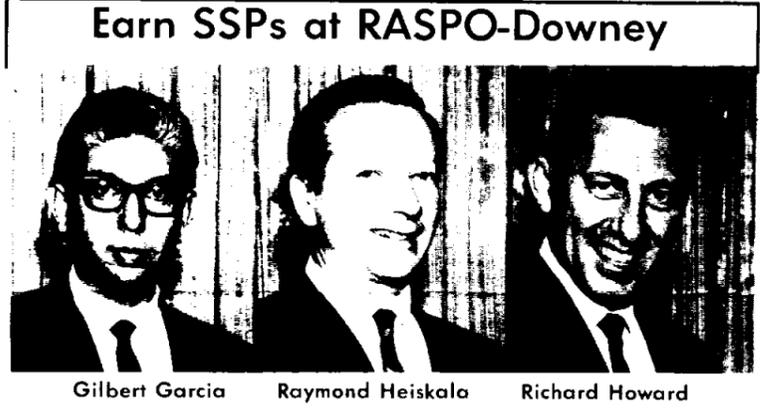
Such a space shuttle also could be used as global transport for point-to-point traffic in military, commercial or cargo service and its safety and comfort standards would be comparable to those of large transport jets, Mueller said.

The space shuttle described by Mueller could carry from 25,000 to 50,000 pounds of payload at a cost approaching \$5 per pound. This compares with a cost of about \$300,000 per pound needed to orbit satellites 10 years ago.



The *Roundup* is an official publication of the National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for MSC employees.

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Apollo Guidance Programs Sound Like Racetrack Lineup

Sundance—Colossus—Luminary—Sundisk.

They may sound like the lineup for a race at Hialeah but they are actually names for four computer programs for the Apollo program.

Colossus, for example, is the

computer program American astronauts will use in their Apollo onboard guidance computer to navigate the track to and from the moon.

Luminary is the programmed computer instructions for assisting the astronauts in landing on the moon's surface.

Sundance is the program for the lunar module in earth orbit and Sundisk for the command and service modules in earth orbit.

Both the Apollo spacecraft command module and lunar modules have a computer as a key part of their guidance and navigation systems.

The Colossus and Luminary computer flight programs, when matched with precise information about the spacecraft's movements, allow the computer to compare and calculate spacecraft course changes and issue steering commands for the spacecraft's rocket propulsion systems.

The guidance computer is a sophisticated and versatile general purpose digital computer designed for deep space flight.

Straight Talk from your Credit Union

By Paul Sturtevant
 Money problems seem to get bigger at Christmas. The average employee usually has problems spreading his cash to cover all the gift buying (and January bills).
 One way to solve many of these money problems is to see the MSC Credit Union, where there are no hidden charges—just straight talk.
 Another way to save money at the Credit Union is through share-backed loans. Loans backed by the member's share account are charged three-quarters of one percent a month interest instead of the usual one percent rate.

Do your share for Freedom!

Sign up for **SAVINGS BONDS** **NEW FREEDOM SHARES**

Your Job in Focus

Annual Performance Evaluations

Annual performance evaluations will be conducted during January for all MSC employees except those individuals serving probationary periods, employed on a fee or contract basis, or employed on a limited appointment of one year or less. All employees are urged to give serious thought to questions or topics they might wish to discuss with their supervisors during the evaluations. Supervisors will be discussing job performance with their employees, areas in which they excel and areas in which improvement is needed.

A performance appraisal should be considered a constructive endeavor from which both employee and supervisor can benefit immeasurably. The employee learns how his immediate supervisor feels about his overall work performance and the supervisor has the opportunity to channel the efforts of his employees toward specific improvements. This type of information provides performance guidelines to aid in career advancement. The appraisal process can be an effective tool in improving and promoting job effectiveness. All employees are encouraged to be active participants.

Women in Government

The U. S. Civil Service Commission has issued the first comprehensive data covering the employment of women in the Federal service. This report, "The 1966-67 Study of Employment of Women in the Federal Government," includes comparative statistics by Agency, grade level, selected occupational groups, and geographic area.
 The report reveals that as of October 31, 1967, a total of 659,403 women were employed in white-collar positions, representing 34.1% of the total work force in this category. These

figures represent an increase from 617,220 (33.6%) on the roll as of October 31, 1966.

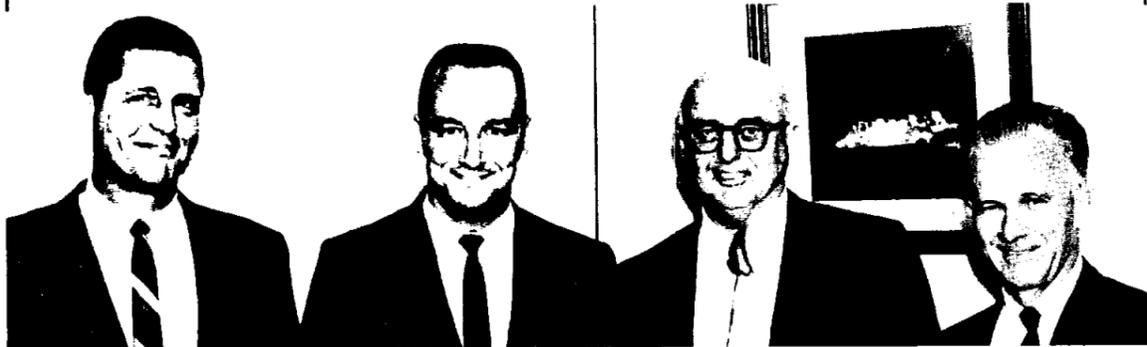
An index of progress in providing equal opportunity for women in the career occupations is reflected by the trend in Federal Service Entrance Examination appointments. This examination, one of the principal entry routes into Federal service for college graduates, has shown a marked increase in both the number of women applicants and the number appointed. In 1963, 18 percent of the appointments for this examination were women; in 1967, this percentage had sharply increased to 35 percent. This rate is being maintained in 1968. While the percentage of women appointed has nearly doubled, in comparing 1963 and 1967, the actual number of women appointed has nearly tripled, increasing from 1,807 to 5,180.

Co-op of Month



MR. DEPENDABLE — Roy Paul Henrickson of Flight Performance and Dynamics Branch has been working on control system simulation design and evaluation for advanced lunar flying vehicles. Lack of engineering guidelines for these "way-out" projects brought Henrickson's judgment and initiative into focus on the problem with the self-assurance of an engineer with more experience and training.

Receive Length-of-Service Awards



LONGEVITY—Five employees of the MSC Reliability and Quality Assurance Office recently received service awards. Left to right are Thomas J. Adams, Jr. 15 years, Daniel D. Becker 15 years, Edward C. Canull 15 years, Henry C. Stearns 15 years, and Paul V. Lucas 25 years.

Task Group Reviews NASA-College Program

A report evaluating the results of a decade of cooperation between the nation's universities and NASA has been published by a special task force.

Titled, "A Study of NASA University Program," the 79-

page booklet contains an assessment of the programs and how it has benefited the academic community as well as the agency. The booklet suggests means to improve the NASA-university relationship. NASA has dealt with about 250 universities, including several foreign ones.

The report was made by a 16-man task force appointed by Francis B. Smith, NASA's Assistant Administrator for University Affairs. The task force, under Chairman Homer G. Morgan, NASA's Langley Research Center, Hampton, Va., contained representatives of two universities as well as of NASA program offices and field centers.

Published as SP-185 by NASA's Office of Technology Utilization, the booklet is available at \$3 from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va., 22151.

EAA to Sponsor Kids' Yule Party

The EAA-sponsored Children's Christmas Party will get underway at 1 pm December 14 with the arrival at the MSC Auditorium of Mr. and Mrs. S. Claus.

Entertainment will include two cartoon films, "The Littlest Angel", and "Santa Claus, Punch and Judy and Howdy Doodly's Christmas," and a visit by Channel 13's Cadet Don.

Each child will get a gift at the end of the program. Children ages 2 to 12 are invited, and kids under 5 may be accompanied by one parent. Parents of children above 5 should plan to pick them up at the Auditorium at 3 pm.

Tickets at \$.50 each are available from the following persons, Bldg/Room, Ext:

Martha Caballero, 4/328, 24-21; Edi Quinn, 4/248, 5558; Ron Hayes, 2/326, 3901; Charles Wilson, 15/120, 4455; Susan Golden, 30/2033, 5126; David Bell, 16/264D, 3286; Lecie Scott, 419/115, 2473; and Cookie Underwood, EAFB 212, 7267.

Heatshield Researchers Find Fireproofing Foam

A lightweight plastic foam, derived from NASA space research, shows great promise for industrial fire protection, particularly fuel fires.

The foam was developed at NASA's Ames Research Center, Mountain View, Calif., by scientists who were doing research on materials for use as heatshields on spacecraft entering the atmosphere.

The Ames-developed material is an extremely light polyurethane foam with additives which forms a tough, protective char layer when exposed to flame while at the same time releasing fire-extinguishing gases which help quench the flame. Used to fill airspaces within structures, the foam would prevent oxygen from reaching and feeding a fire.

Demonstrations have shown that the material may be suitable for fire protection in aircraft, spacecraft, homes and other structures. Other possible uses include automobiles, boats, trains, and in such industries as oil refineries, paint and chemical processing and laboratories.

There is little essential difference between protecting a re-entering spacecraft from the flaming gas cap which results from atmospheric friction and protecting the wall of a room from fire or heat of an explosion.

Fire is spread in two ways. Either heat reaches flammable material by direct contact of very hot gases (flame), or by intense radiation of heat from a very hot object, such as the filament of a heat lamp.

Like a heat shield, the foam undergoes ablation. As it is heated, it produces an outflow of gas which pushes fire away from the object being protected—a speeding spacecraft or the room wall. As heating continues, the foam forms a tough, cohesive layer of char, a black, highly insulating, highly heat-resistant material. The char first insulates the material by preventing heat from flowing through. As it gets hotter on the flame side, it re-radiates the heat it has absorbed back into the fire and away from the material it protects.

The foams so far developed in the three pounds-per-cubic-foot density range have a compressive strength of 30 pounds-per-square-inch before collapse. The Ames researchers have added glass and carbon fibers to increase strength up to seven times. This means the foams may have structural application and various types of mechanical cushioning uses in addition to fire prevention.

In addition to the newly-developed foam holding promise as a very low-weight heat shielding material, weighing considerably less than present heatshield materials, its density can be varied from two to 50 pounds-per-cubic-foot.

It has still other advantages. The low density, closed cell structure is highly resistant to heat flow, making it an excellent insulator even without char. When used with flammable liquids such as gasoline or cleaning agents, its closed cell structure prevents the flow of liquids or the soaking up of liquids by the foam. Both qualities retard fire.

The NASA Ames scientists who invented the foam are Dr. John A. Parker and Salvatore Riccitiello.

20-Year Award

Glory Allahverani
Procurement Division

Roundup Swap-Shop

(Deadline for Swap-Shop classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Ads are limited to MSC civil service employees and assigned military personnel. Maximum length is 20 words, including name, office code and home telephone number. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested.)

FOR SALE/RENT—REAL ESTATE

4-2 1/2 in El Lago by owner, 2700 sq ft, wooded third acre. \$35,500. 434 Bayou View Drive. M. Kayton, 877-1358.

3-1 1/2 brick in Sunvalley, air/heat, built-ins, fenced, trees, much storage. Equity, assume \$13,818 5/4% GI, \$125/mo. Schutt, 944-8138 after 6.

165x79x200x52-ft lot in Pine Oak Cove, Dickinson. Roby, 946-1869.

FOR SALE—AUTOS

63 Rambler 660 Classic 4-door staight 6 std shift, 22 mpg, reclining seats make into bed. Under retail at \$460. Barbara Matelski, 944-1280 after 5.

62 4-dr Valiant, autotrans, R&H, new tires, xclnt condition. \$320. M. Kayton, 877-1358.

68 Corvette Stingray convertible, blue, white top, 327, air, autotrans, radials, positraction, AM/FM. Jere Cobb, 591-3516.

63 Chevy II, air, new brakes, recent tune-up, good second car. \$350. Ivan Ertel, GR 1-1878 after 5:30, weekends.

68 Triumph Spitfire, British racing green, wire wheels, radio, radials, tonneau, undercoated, 7000 miles. \$1950. Jim Cooper, MO 8-8168 after 6.

64 Continental sedan, all power, low mileage, xclnt cond, leather, silver gray. \$1375. Jim Wray, Jr., 591-3667 after 5.

66 Plymouth VIP 4-dr hardtop, air, pwr steering, brakes, windows, Powerflite, xclnt cond, low mileage. Lilian Smith, HU 7-3434.

66 Chevrolet Impala sports coupe, air, autotrans, pwr steer, radio, sell or trade equity for truck. B. Hood, MI 5-2339.

68 Impala sports sedan, full power, air, 327 engine, Turbohydramatic, AM/FM. Paul Weitz, 591-3071.

61 Pontiac 9-passenger Catalina station wagon, clean, xclnt cond. J. M. Balfe, 877-1181 anytime.

64 Rambler 660 Classic 2-dr, std 6, reclining seats, radio, air. \$655. B. M. Wood, 591-2373.

59 Pontiac wagon, xclnt cond, good hunt/fish/work car. \$225. McConnell, 944-5680.

FOR SALE—MISCELLANEOUS

27-in GE electric range, good condition. Needed larger range. Best offer. Sally Gates, 932-4088.

Large variety new HO model trains: engine \$5, freight cars \$.75, passenger cars \$2. M. J. Bledsoe, 422-2505 Saturdays.

Portable 10-in B&W TV, two months old, still in warranty. Cost \$95, sell \$70. Goodrick, 522-9958.

Professional-quality shortwave radio, tunes in international broadcasts. Goodrick, 522-9958.

Columbia 22 sailboat, 5-hp outboard, dinette-galley, lights, No. 2 winches, head, fwd hatch, working sails. Walt Henry, 591-3934.

RCA combination washer/dryer, 7 yrs old, good appearance and working condition, \$20. Sue Smith, 591-4761.

Newly-upholstered hideabed; working Magnavox hi-fi; working B&W RCA portable TV; two 9x12 oval rugs in fair condition. R. C. Puffer, Dickinson 534-5648.

Original design trigear low-wing aircraft, 70% complete, needs engine, wings, have spars and some materials, \$300. James F. Moody, 946-4013.

Sylvania stereo-radio combo, perfect, \$95. Slingerland snare drum, case, stand, like new, \$60. Used few weeks in high school band. 877-2859.

French provincial endtables, coffee table, good condition, \$25. Two like-new 24-in bar stools, \$15. L. Cox, 483-4897 (No home phone).

Maple Edison baby crib w/mattress, \$20. Baby stroller, \$5. VW sedan luggage rack, \$9. Zieglschmid, 474-3308.

12x15 tan wool rug and pad. K. Baird, 877-1419.

Hammarlund HQ-170 w/clock. Johnson Valiant. 10-meter beam. Knight SWR meter. Co-ax spares. \$300. Wikstrom, 427-1817 days.

Maple barstool, brass footrail, \$25. Electronic organ w/bench, \$150. 20-ga shotgun, \$35. Ussery, HU 8-1825.

Stereo portable record player, 4-speed changer, remote spkrs, \$35. Jim Horning, GR 4-3838.

Girls: for a free Pennyrich bra, call Ruby Berka, GR 2-1774 after 5.

One pair 63x80-in wood French doors w/15 glass panes each and blue drapes, \$35. Dutch von Ehrenfried, 591-4163.

19-ft fiberglass deep-V boat, 150-hp Mercruiser, trailer, sell or trade equity for car, truck or boat. B. Hood, MI 5-2339.

Give a puppy for Christmas. AKC silver toy poodles, healthy, clipped, \$75 and up. B. Williams, 944-1524 after 5.

8-week old Persian kittens, xclnt Christmas gifts. R. R. Ritz, 591-2433.

Learn to fly with Aero Club. Cessna 150 \$7/hr wet; C-172 \$9/hr, K-Bonanza \$5/hr. Ward, 877-3187.

Fur stole, cost \$295, sell \$125. Tarpley, 534-2167.

Fancy ladies diamond dinner ring with four diamonds totaling one carat, \$200. Tarpley, 534-2167.

Sylvania stereo-radio combo, perfect, \$95. Slingerland snare drum, case, stand, like new, \$60. Used few weeks in high school band. 877-2859.

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12x15 tan wool rug and pad. K. Baird, 877-1419.

3 1/2x7-ft pool table w/slate-impregnated bottom, hardly used, \$125. McConnell, 944-5680.

Two almost new Goodrich 8.25x14 tires, \$30. McConnell, 944-5680.

WANTED

Want to join or start carpool from area north of Red Bluff Road and south of LaPorte Fwy, 8-4:30. M. Pettit, 472-1425.

Office-size man's desk, preferably with central locking mechanism and modern styling. C. E. Whitsett, 488-1337.

Persons interested in post-Christmas mountaineering in Colorado's Sangre de Christos. Should have equipment, experience in snow/ice climbing. Juday, 946-0898.

Day companion in home for semi-invalid, no housework, 5-day week in Nassau Bay. D. H. Johnson, 591-3541.

Chair that converts into bed; Simmons Co. has built these in past, condition not important. Stephen Jacobs, PR 4-9924.

Five-string Gibson or Fender Blue Grass-style banjo. G. A. Nixon, 483-3758 (No home phone).

Three girls to help sell Pennyrich products. Ruby Berka, GR 2-1774 after 5.

.22-cal bolt-action repeater rifle in good condition and reasonable. E. L. Wright, 877-3059.

Rock polisher, simple model for use by young boy just beginning. Paul Weitz, 591-3071.

Small or medium-size utility trailer. Paul Weitz, 591-3071.

Fifth member for carpool from Gulfgate 8-4:30. Jonny Ferguson, 747-0403.

Need approximately 10 people to form investment club to develop commercial lot. W. H. Hooper, 488-4120.

LM Contract Value Upped

NASA has signed a Supplemental Agreement with the Grumman Aircraft Engineering Corporation valued at \$21,477,120 for changes in the Apollo Lunar Module contract.

The agreement formally incorporates into the Grumman Contract 94 changes previously authorized and 24 amendments to previously definitized changes by NASA for modification to the contractor's documentation and reporting procedures for test and checkout of the LM, for modifications to flight and ground test hardware, for additional test and safety analysis, and for crew safety hardware changes.

The modifications bring the total estimated value of the Grumman contract since January, 1963, to \$1,602,521,120.

Grumman performs the majority of work on the Lunar Module contract at its Bethpage, New York facility with support from its field offices in Houston, White Sands and at the Kennedy Space Center.

Weekend Flight Line



SMALL-SCALE AVIATORS—Members of the MSC Radio Control Club in good weekend weather set up a miniature flight line on the MSC Antenna Test Range west of Bldg 14. In the photo at upper left, Don Miller primes the engine of his semi-scale biplane and prepares to holler "Contact!" as kibitzers stand by to make sure he does it right. Bill McCarty's low-wing "Thunderball," upper right, makes a landing approach. This aircraft is typical of the stunt or "pattern" type radio-control plane designed to execute any kind of aerobatic maneuver. "Thunderball" has a 65-inch wingspan, weighs about six pounds and is built mainly of plastic and styrofoam. At lower left, Don Cole's exact-scale Boeing-Stearman PT-17 "Kaydet" is faithful to the real McCoy down to wing rib spacing and rigging wires. The 12-pound Stearman has a span of 66 inches. At lower right, Don Miller's leg serves as a chock while he cycles the control surfaces with the radio-control transmitter. Biplanes tend to be popular with spectators, but few radio-controllers want to build two wings.

Langley-Developed Sound Device May Aid Hardware Ocean Salvage

A finger-size cylinder may someday guide recovery teams through the ocean depths to the precise location of a submerged vehicle.

The tiny underwater detection device was developed by engineers at the NASA Langley Research Center.

Many of the vehicles and rockets launched by NASA fall to the bottom of the ocean when they have completed their flight. But often these had to be located and recovered for postflight analysis.

Dye markers, smoke bombs and, in some cases, buoys helped mark the impact areas but recovery could be a difficult and tedious operation. On occasion, salvage operations were unsuccessful wasting both time and effort.

A self-contained 12-ounce cylinder only three and three quarters inches long and may reduce search time underwater to a minimum.

The device is the end product of more than three years research at Langley. Engineers began with a Navy-developed locator used in mines.

But to be of real value in

space, the location device had to be miniaturized—scaled down from its original weight of three pounds.

The cylinder is a water-actuated transmitter that can be mounted either internally in a payload or externally on a rocket motor, camera pod or instrument package.

When it hits the water it begins to emit a constant pinging sound. With receivers, recovery teams can zero in on the pinging to the submerged object.

In one test, an aircraft crash recorder with the tiny transmitter attached was dropped from a helicopter at an altitude of 5,000 feet.

The recovery team moved in by boat for the search armed only with receivers and coordinates of the 100-square-mile impact area.

Approximately every 2,000 yards the boat would stop. The receivers were placed in the water and swept in a circle in an attempt to pick up the signal which has a range of more than 4,000 yards.

The boat continued this sweeping operation every 2,000 yards, to overlap the search

pattern. With this method, the entire 100-square-mile area could be covered in two hours.

JPL Gets 'Go' to Fly Two Mars Mariners

NASA has authorized the Jet Propulsion Laboratory, Pasadena, Calif., to proceed with two spacecraft to orbit Mars in 1971. This action was made possible by final approval of the FY 1969 NASA appropriation bill by the Congress and the President.

Each of the two Mariner spacecraft will study the planet from orbit for a period of three months or more, beginning in November 1971, JPL engineers said. JPL has been assigned project responsibility for NASA's twin planetary exploration effort, with funds already allocated for the Fiscal Year 1969 portion of the work.

The program manager at NASA Headquarters for the program is Earl W. Glahn. At JPL, Dan Schneiderman is the project manager and Robert Forney is the spacecraft system manager.

Each of the two spacecraft planned for the 1971 mission

will complete the trip from Earth to Mars in six months. The launch period will open in May 1971 with arrival at the planet in November 1971.

Current plans call for the first spacecraft to orbit at an inclination of 60 degrees to the planet's equator. This orbit would permit it to examine about 70 per cent of the Martian surface.

The second spacecraft could then be placed in a near-polar orbit inclined 80 degrees to the planet's equator. This orbit would provide for examination of the Mars polar cap and high resolution coverage of selected areas. The higher inclination orbit would also permit oblique views of broad areas of the planet's surface and possibly an examination of its two moons, Phobos and Deimos.

An Atlas-Centaur launch vehicle will boost each of the two Mariner 1971 spacecraft. The spacecraft weight will be in the 2,000-pound class of which about 1,100 pounds will be placed in Mars orbit. About 900 pounds will be used for propellants. The payload of scientific instruments will weigh about 125 pounds.

The combined mission of the two Mariner Mars 1971 spacecraft will furnish data that may assist in establishing touchdown sites for the first Mars lander mission currently planned for 1973.

Scholarships

(Continued from Page 1)

Students now in college are also eligible for scholarships.

Scholarship application forms are available from Clara H. Ingleberger, Administration Directorate, Building 2, room 873. Completed forms in sealed envelopes must be returned to Clara Ingleberger, code BA, no later than February 15, 1969.

The MSC Scholarship Committee is appointed by the Chairman, NASA Exchange Council—MSC, subject to approval by the Director. They will evaluate students' applications and scholastic records and the Chairman, NASA Exchange Council—MSC, will make the final decision of winners.

All information will be kept confidential and will be reviewed only by the Committee.

The winners of the two scholarships will be notified by mail no later than April 15, 1969.

Seek to Form Art Club

MSC employees interested in forming an MSC Art Club to conduct programs and instruction classes on fine arts, folk art and crafts are asked to call Donna Bowers at 4395 or Dorothy Baker at 3254.

Apollo Countdowns Take 500 Miles Of Recording Tape

The Countdown Demonstration Test and launch for an Apollo/Saturn V Space vehicle is all wrapped up in tape.

The 1,308 reels of magnetic recording tape used to document the Operational Intercom System during the test—a full dress rehearsal of an actual launch—and the launch itself would make a stack three stories high or form a quarter-inch ribbon 446 miles long.

The intercom system at the Kennedy Space Center Launch Complex 39 has a capability of serving 2,000 personnel on 112 different audio channels.

The tapes provide a procedural history of the launch preparations and countdown. Voice commands and responses for each step leading up to launch are preserved, documenting all systems at every moment in the test procedures.

Planning Christmas Concert



CHORUS OFFICERS—Bay Area Chorus president Angela Smallidge and choral director Wayne Bedford discuss final preparations and rehearsals for the December 15 annual MSC Christmas Concert. The concert, scheduled for 8:30 pm in the MSC Auditorium, will feature works by Antonio Vivaldi and Benjamin Britten and is free to all MSC employees. Members of the Houston Symphony will accompany the chorus.

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